

Working memory?

[Experience](#), [Memories](#)



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Write-Up

The field of memory provides excellent opportunity for research, drawing theoretical models and implementing them to check their validity. Working memory, in psychology, is a memory system that holds information to perform various verbal and non-verbal (even physical) tasks. It is very important from the viewpoint of processing information and enacting it in day-to-day life. Though a simple three stage model for memory (Encoding, storage and retrieval) was proposed initially, experts like Baddeley proposed that working memory is much beyond these three phases and memory functions of short-term memory and long-term memory are very complex in comparison to what initial chunking of memory into theoretical aspects initially suggest (Becker & Morris, 1999). He introduced a novel approach to depict working memory as a not as three-part system that temporarily holds information as people perform cognitive tasks but a perennial work-desk on which information is manipulated and assembled to help us comprehend decide, and in problem-solving (Baddeley, 1996, 2003).

According to Baddeley's view of working memory, we can pictorially imagine a managerial executive (Central executive memory) with two helpers (Phonological loop & Visuo-spatial working loop) (Hamilton, Coates & Hefferman, 2010; DeRenzi & Nischell, 1975). This theory and its fractionization have neuropsychological evidence, experimental evidence and developmental evidence. A study states that left posterior hemisphere of the brain is actively involved in working memory. Other studies show that even right posterior is actively involved but in working memory but non-visual aspects. It might be involved in spatial aspects. Despite the heavy argument, involvement of different brain regions in working memory (Phonological and visuo spatial) establishes a base for neuro-psychological evidence (Vallar & Baddeley, 1984; Hamilton, Coates Hefferman, 2010).

Laboratory based experiments show how visual short-term memory task is strongly disrupted by visual as opposed to spatial interference, and also spatial memory task was simultaneously more strongly disrupted by spatial interference. This double dissociation supports the theoretically proposed fractionation of working memory (Klauer & Zhao, 2004). Developmental evidence suggests that visual subcomponent of the visuo-spatial sketchpad is distinct from the spatial subcomponent as seen in children aged 5-6, 8-9 and 11-12 (Logie & Pearson, 1997). Thus, arising from strongly evidenced studies, Logie presents a distinct model of two separate systems (Visual and Spatial) (DeRenzi & Nischell, 1975). The visual storage aspect stores information about form and colour whereas spatial control takes care of aspects pertaining to locomotion, limb movements and also rehearsal of

information (or series of information in visual cache) (Logie & Pearson, 1997).

The proposed study explores the topic of fractionalisation of memory in lines with the above mentioned strong theoretical and research based evidence. However, the trajectory of interest is along the lines of research done by Logie and Pearson (1997) in developmental field. This study examines the visual and spatial development in children and adults.

There may be many limitations pertaining to use of methodology. The visual recall of design and Corsi blocks are two distinct materials, not only in terms of format but also in terms of material to be recalled. Thus comparison of two unequal factors may raise questions about the validity and outcomes of the studies. Logie and Pearson's study focussed solely on children of different age groups, but since it is purported to measure visual and spatial aspects of working memory under a developmental pathway, this study will use children and adults as subjects (Logie & Pearson, 1997; Klauer & Zhao, 2004). Other arguments against the reliability and objectivity of studies in this area have been in terms of usage of participants and individual, genetic, ethnic and anthropologic differences within the patterns of development. It is not possible to outline a single or a group of factors that predict the pathway of development.

Our research hypothesis is designed to measure two questions. The first part of the hypothesis seeks to inquire whether according to the fractionation; the visual and spatial systems should develop at different speeds in humans. In accordance to the first part of the hypothesis, the second part inquires

whether the developmental trajectory for visual system is shallower than spatial system.

Method

Participants

The study has 139 participants in all comprising of 65 (46. 8%) children and 74 (53. 2%) adults. Among these participants are 56 (40. 3%) males and 83 (59. 7%) are females. The mean age for boys is 15. 65 years and that for girls is 18. 5 years.

Materials

Two basic materials (tests) have been utilised viz: Visual recall of designs and Corsi Blocks. Therecall of designis a paper-pencil task that requires the experimenter to show a particular design on paper to participants for 5 seconds and the participant recalls it by drawing it on paper (Logie & Pearson, 1997).

The Corsi testpresents a blue board with nine wooden cubes. The experimenter taps out a sequence of blocks (in increasing order after each successful completion) and the participant taps out the blocks in exactly the same sequence (Fischer, 2001).

Design

The variables design in a classroom based experimental condition testing factors between subjects (Adults, Children) and within subjects (Males, females) performance of Recall of design and Corsi. The visual and spatial

working memory development are the Independent variables whereas the developmental trajectory is the dependent variable.

Procedure

In a classroom settings, both children and adult group were individually given tasks performance on Visual recall of design and Corsi block task. The scores of recall of design and corsi test were done during task administration itself. Calculated scores for each individual in the adult and the children group are put up before conducting statistical analysis.

Statistical analysis

Statistical analyses used can be divided into Descriptive statistics and inferential statistics. SPSS 19. 0 was used for data analyses. Graphs, Histograms and Comparative bar charts along with mean and median related data falls into descriptive statistics category.

We have also conducted two unrelated t-tests; one to compare children's recall of design with adults and the other one to compare children's Corsi scores with that of adults.

The mean score of children on visual memory is 14. 17.(Mean= 11. 02, sd= 1. 727)

and that of adults is 14. 42 (Mean= 17. 45, sd= 2. 765). The mean score of children on spatial memory is 11. 02 (Mean= 14. 17, sd= 2. 275) and that for adults is 17. 45 (Mean= 14. 42, sd= 2. 196).

The above table clearly shows that with respect to the spatial component there is a statistically significant difference between the adult mean and children's mean ($p = 0.000$) which is well below the 0.05 threshold. In fact from the above table it can be seen that the adult mean score is 17.45 whilst that of the children is 11.02 meaning that on average the adults scored about 6.4 more than the children.

The above table clearly shows that there is a statistically significant difference between the adult mean and children's mean on spatial component ($p = 0.000$) which is well below the 0.05 threshold which is very highly significant

The above table clearly shows that in terms of the visual component there is no statistically significant difference between adult mean and children's mean ($p > 0.5$) which exceeds the 0.05 threshold. It depicts how the mean difference between adults and children in relation to the visual component is very small resulting in no statistically significant difference in mean scores.

Since there is high significance between the children and adult's spatial component but no statistical significance between children and adult's visual component, we can say that there might be a different trajectory in children and adult's development patterns. It doesn't however completely fulfil the hypothesis.

Discussion

The findings do not support the hypothesis in all earnest. There is no correlation between children and adult scores on visual component but there

is a very significant relationship between children and adult scores on spatial component. It may be said that the difference has emerged because of the previously raised issue of different methods. Since, Corsi and Recall of design are two distinct tasks, it can be argued that their performance cannot be correlated. However, since the spatial component shows good correlation, it signifies that the trajectory may be well defined and that it develops more easily. However, not much light is thrown on why the results have come up the way they have. Further research may be interested in using Multiple regression to predict the possible factors that may have caused a high correlation in spatial scores and if there are any common factors in children and adults, they might as well be highlighted. However, like previous studies, this study supports the Logie -Pearson model as well as justifies the fractionation approach given by Baddeley. Memory is much beyond its' structural and functional aspects. Though initial divisions on memory and development of theories have described functions and its' aspects at a superficial level, this research has gone in depth to investigate difference in developmental trajectories. Since, it is a part of developmental aspect, it has many possibilities of further research (Baddeley, 2003; Logie & Pearson, 1997).

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